"Braille Box: A smart news reader"

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1.ABSTRACT

According to the World Health organization (WHO), 285 million people are estimated to be visually impaired worldwide among which 90% live in developing countries, and forty five million blind individuals world-wide. Though there are many existing solutions to the problem of assisting individuals who are blind to read, however none of them provide a reading experience that in any way parallels that of the sighted population. In particular, there is a need for a portable reader that is affordable and readily available to the blind community.
The brail box consists of 6 solenoids interfaced with Raspberry Pi that forms the refreshable Braille display. The android things package installed on Raspberry Pi is responsible to fetch the news from the news API. Once fetched, the news is converted into Braille format by the processor.
The output is character to character conversion of the internet fetched news to Braille format .This Braille format is displayed by the Braille display constructed with the help of electromagnetic solenoids. The system finds interesting applications in libraries, offices etc where instructions and notices are to be conveyed and also in assisted filling of application forms.

2.INTRODUCTION

Brail box is a device of raised dots arranged in cells. Any combination of one to six dots may be raised within each cell, and the number and position of the raised dots within a cell conveys to the reader the letter, word, number, or symbol the cell represents. There are 64 possible combinations of raised dots within a single cell. Due to the varying needs of Braille readers, there are three different grades of Braille. Braille was developed by Louis Braille in the beginning of the 19th century. 6 dot Braille letters, common punctuation marks, and a few symbols are displayed as raised 6 dot Braille cell patterns read by using a fingertip to feel the raised dots. The 6 dot Braille alphabet, the method for representing Braille numbers, and some Braille punctuation marks are used in all languages that share the Roman alphabet. There are variations of 6 dot Braille in various Roman alphabet languages. Representation of
punctuation marks and differences in the meanings of other 6 dot Braille cells are commonly used to represent special characters and/or common letter combinations. The Braille box is a portable reader that allows visually impaired to read sequence of pattern that represents letters, words and symbols. From this system we can create complete word representations by piecing together combination of letter representation with the help of electromagnetic solenoids.

3.WORKING

A. Technique.

In this section, we present the flow of the model as depicted .in the block diagram shown in Figure 1.When the user wants to access the news with the push of a button, the news content from the news application program interface (API) is fetched and processed by the Raspberry pi hardware using android things as the operating system. Then it gives the output in the
braille format which the visually impaired person can read by keeping his palm on the device

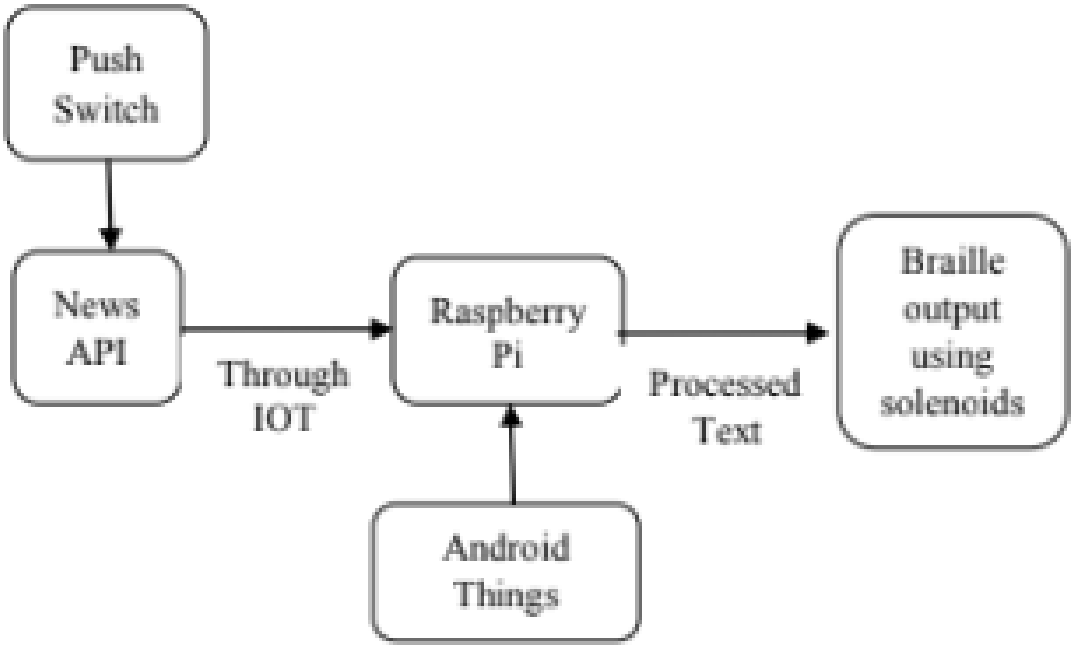

Figure 1. Block diagram

B. Overview of the design

1) Solenoids

The device makes use of the magnetic field generated from the electric current in order to produce a linear motion. A solenoid is a coil of wire in a corkscrew shape wrapped around a piston, usually made of iron. The benefit of having Electromagnets over the use of permanent magnets is that, they can be switched on or off by the application of the electric current, which makes them useful as switches and valves. The solenoids are the part of circuit which allows to display the Braille sequences to the user. The 6 solenoids are arranged according to the braille pattern as shown in Figure 2. These are driven by the 6 assigned General Purpose Input Output (GPIO) pins from raspberry pi board as it decodes the content in the news API character by character.

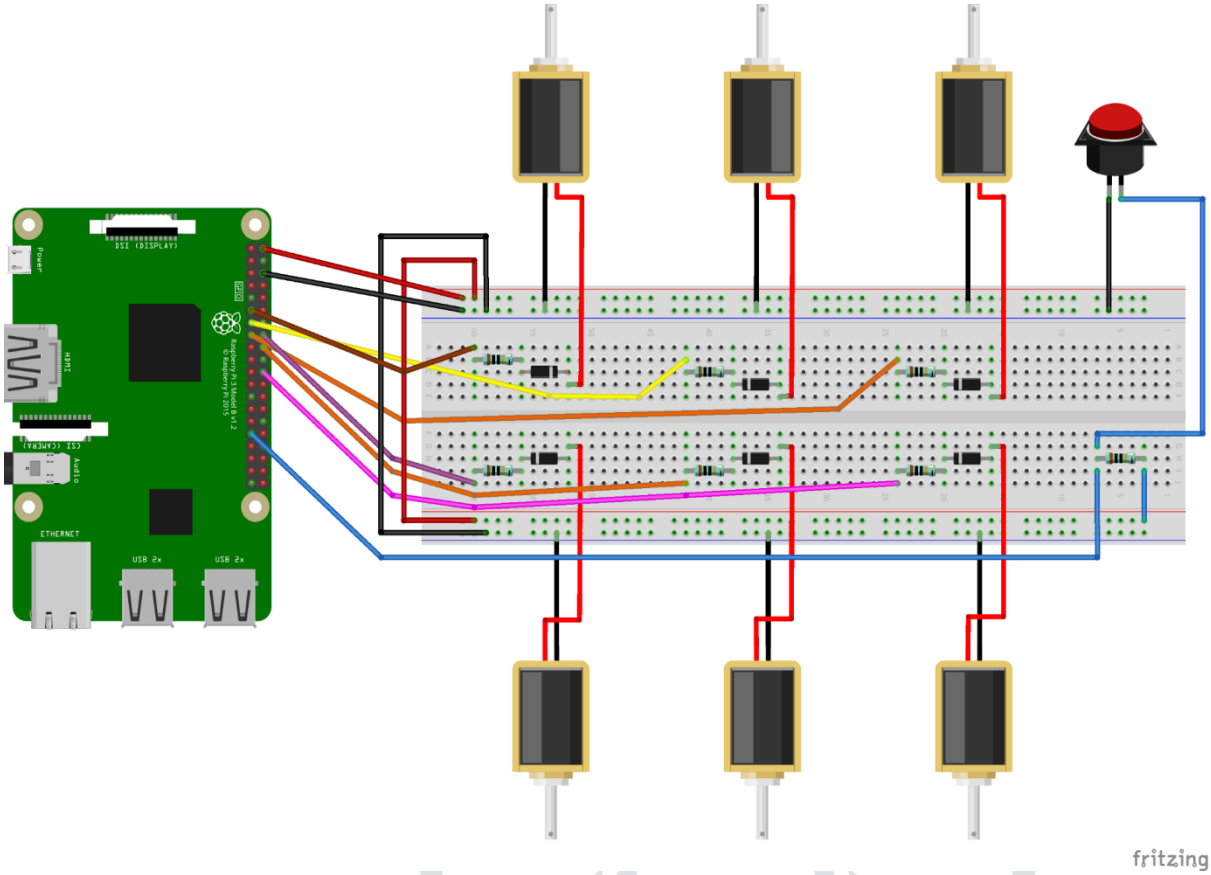

Figure 2.

2) News api

API - An ***a****pplication* ***p****rogram* ***i****nterface* (**API**) is a set of routines, protocols, and tools for building software applications. Basically, an API specifies how software components should interact. Additionally, APIs are used when programming graphical user interface (GUI) components. A good API makes it easier to develop a program by providing all the building blocks. A programmer then puts the blocks together.News API is a simple and easy-to-use API that returns JSON metadata for headlines and articles live all over the web. News API indexes articles from over 5,000 worldwide sources. We can select the appropriate news API needed for us and get the information by using the specific news API URL and its corresponding key.

3) Raspberry Pi computing unit

The computing unit chosen is a Raspberry Pi Model 3B which has Broadcom BCM2837 Chipset, 1.2GHz Quad Core 64 bit ARM cortex A 53 processor along with Wireless LAN (WLAN). This can be programed effortlessly in android java with android studio making use of the android things operating system.

4.APPLICATIONS

Braille has only been the solution for the blind community and the currently used Braille systems and devices are not very flexible and usually expensive. The Braille box is cost effective and feasible device which helps the reader to access the latest news in a very effective way.

- The Braille box finds its application at blind school, where students can learn Braille language.
- It can be used as a source for visually impaired to prepare for examinations.
- It can be used as a Braille reader where pdf or text file can be read by the reader in

Braille format.

5.LIMITATIONS

Audio Information and Assistive Technology: Two of the main reasons for the decline in Braille literacy are audio formats of books and assistive technology. People who support these technologies believe that blind people can learn the same skills by using screen. Readers, listening to audio books instead of reading information in Braille. Also, these people believe that the use of audio and assistive technologies lessens the need for Braille equipment and production. A book, for instance, can simply be stored in a small mobile device with a screen reader rather than being produced in Braille in large volumes.

6.FUTURE WORK

• Braille box can be used as a USB plugable device where the information stored can be converted into Braille format.

• A audio device can be implemented by integrating text to speech conversion algorithm. .

• A hard copy of the converted Braille pattern can be made by integrating a printer

7.CONCLUSION

The information fetched form the News API is successfully converted to Braille pattern using Raspberry Pi and android things and displays it out clearly on the refreshable Braille display. This is an economical as well as efficient prototype for the visually impaired community as it would promote blind literacy. The cost effectiveness of this proves to be its greatest advantage.

8.REFERENCES

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Vivek SM. A received the B.E (2018) from the Department of Electronics and Communication Engineering from Visvesvaraya Technological University, Karnataka. He is constantly involved with the NGO’s, sticking to contribute to the society. His key interests lies in helping the needy, with the help of latest technology in the field of Electronics & Computer Science.